

NMR Study of vortex dynamics in a organic superconductor at selective nuclear sites

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Abstract

The NMR method is an useful probe for study of the vortex state. Actually, anomalous fluctuations of vortices and a possible phase transition in layered superconductors were first pointed out for an organic superconductor κ -(BEDT-TTF)₂Cu(NCS)₂ by ¹H-NMR experiment, which can probe the field fluctuations. We have extended the NMR study of the vortex dynamics in κ -(BEDT-TTF)₂Cu(NCS)₂ to the measurements at three nuclear sites in the BEDT-TTF molecule. The comparative NMR study at several sites is advantageous in the following two ways. First, comparing the relaxation rates, which contain the quasiparticle term and the vortex-dynamics term with site-dependent weights, it is possible to separate the two contributions to the relaxation rate. Second, comparison of the relaxation rates at the ¹H and ¹³C sites gives insight into frequency dependence of the vortex dynamics. By the present analysis, the vortex dynamics contribution to the relaxation rate was successfully separated from the quasiparticle contribution and found to show a peak formation around 2 K with a site-dependent peak height, which is discussed in terms of the frequency-dependence of the field fluctuations.